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Scott S. Slater

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The Surreptitious Geophysical Survey: An Interference With Prospective Advantage

Modern scientific processes and the technology upon which these processes are founded continue to improve at a rapid rate. Meanwhile, courts struggle to keep pace with increasingly complex technology and the practical effects of its use in society.[1] The scientific processes involved in the exploration for oil and gas provide an excellent example of the inability of courts to structure a quick form of relief for harms inflicted by modern technology. The landowner suffers from an inadequacy of legal remedies since the courts have conditioned recovery for harms inflicted by surreptitious acquisitions of information pertaining to subterranean resources upon a physical invasion of the premises. This comment will examine whether the landowner should be compensated for economic losses that result from unauthorized exploratory activities, irrespective of physical entry.

The search for oil and gas is dependent upon the science of geophysics and the derivation of information concerning the internal structures of the earth.[2] "Geophysical exploration" itself does not locate oil; rather, the exploration process identifies formations that are likely to produce oil.[3] Several accepted scientific methods are used by those exploring for oil to ascertain the location, size, and quality of particular subsurface formations.[4] Through these processes, a map of the subsurface structures is obtained, and the tendency of property to produce oil is demonstrated.[5] Oil and geophysical operators are willing to pay large sums to ascertain the potential productivity

1. *See generally* R. HEMINGWAY, OIL AND GAS §4.1 (1971) (discussion of progress of deprivations occasioned by use of modern geophysical methods). *See also* Kennedy v. General Geophysical Co., 213 S.W.2d 707, 710 (Tex. 1948) (refusing to take judicial notice of value of information derived from a geophysical survey).

2. *See* A.I. LEVORSEN, GEOLOGY OF PETROLEUM (2d ed. 1967) 9-11, 612-15; H. WILLIAMS & C. MEYERS, MANUAL OF OIL AND GAS TERMS 318-19 (4th ed. 1976) (definition of geophysical survey) [hereinafter cited as MANUAL].

3. Shine, *Measure of Damages in Suits Relating to Geophysical Operations*, 29 NOTRE DAME LAW 49 (1953).

4. *See* 4 W. SUMMERS, OIL AND GAS §659 (1962).

5. *See* LEVORSEN, *supra* note 2, at 612-15.

of a particular piece of land.[6] Consequently, the right to conduct exploration activities becomes more valuable in proportion to the likelihood that the explorers will encounter an oil producing formation.[7] A corresponding right to explore has developed[8] and the cases uniformly agree that the right is deserving of legal protection.[9] Courts have recognized the economic value of the incorporeal right to explore[10] and have provided legal redress based upon the existence of a "geophysical trespass."[11]

When the geophysical operator proceeds with a survey without permission from the landowner, the theory of "geophysical trespass" provides the property owner with a remedy if a physical invasion occurs in the course of the exploration.[12] Conversely, when the unauthorized survey is conducted from nearby lands[13] or from an airplane flying over the property,[14] and involves no physical invasion,[15] the law has denied recovery.[16] A geophysical survey, however, does not require a physical entry to be accurate and effective.[17] An inequity has developed whereby the law grants a remedy to the landowner for the misappropriation of information concerning the mineral estate only when a physical invasion occurs in the course of the survey.[18] Absent a trespassorial and invasion, protection against the en-

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6. "Large sums of money are annually paid landowners for the mere right to go upon their land and make geophysical and seismographic tests." Layne Louisiana Co. v. Superior Oil Co., 26 So. 2d 20, 22 (La. 1946). Rice, *Wrongful Geophysical Exploration*, 44 MONT. L. REV. 53, 66 (1983).

7. LEVORSEN, *supra* note 2, at 665-66.

8. *See, e.g.*, Phillips Petroleum Co. v. Cowden, 241 F.2d 586 (5th Cir. 1957); Angelloz v. Humble Oil & Refining Co., 199 So. 656 (La. 1940).

9. *See, e.g.*, 241 F.2d 586; 199 So. 656.

10. *See, e.g.*, 241 F.2d 586, 590; Picou v. Fohs Oil Co., 64 So. 2d 434, 435 (La. 1953); 26 So. 2d at 22; *see also* Lloyd v. Hunt Exploration, 430 So. 2d 298, 301 n.2 (La. 1983).

11. 26 So. 2d 20; *see* HEMINGWAY, *supra* note 1, at §4.1; H. WILLIAMS & C. MYERS, OIL AND GAS LAW §230 (1981).

12. HEMINGWAY, *supra* note 1, at §4.1.

13. 213 S.W.2d 707, 711-12; *see also* 2 CASNER, AMERICAN LAW OF PROPERTY §10.9 (1952).

14. No case has considered the precise issue; however, commentators have suggested that no recovery lies under existing law for surveys taken by aerial reconnaisance. HEMINGWAY, *supra* note 1, at §4.1; Shine, *supra* note 3, at 57; Hawkins, *The Geophysical Trespasser and Negligent Geophysical Explorer*, 29 TEX. L. REV. 310, 315 (1951). If the plane flies too low to the ground when conducting a survey an unlawful use of the right of passage would make recovery for the misappropriation of information available. CASNER, *supra* note 13, at §10.9.

15. *See* HEMINGWAY, supra note 1, at §4.1; CASNER, *supra* note 13, at §10.9.

16. HEMINGWAY, *supra* note 1, at §4.1; WILLIAMS & MEYERS, *supra* note 11, at §230. A growing but as yet undefined notion that a wrong is committed when geophysical surveys are conducted from nearby lands now prevails among the commentators. *See, e.g.*, 1 E. KUNTZ, OIL AND GAS §12.7 (1962).

17. Shine, *supra* note 3, at 57; Rice, *supra* note 6, at 55.

18. *See* Shine, *supra* note 3, at 57; HEMINGWAY, *supra* note 1, at §4.1; *see also* KUNTZ, *supra* note 16, at §12.7.

suing economic consequences that result from the survey is denied.[19]

The misappropriation of information concerning the value of a landowner's mineral estate and the economic consequences that may flow from that misappropriation are no less significant in the absence of a physical entry.[20] This comment will demonstrate that the interests at stake require that recovery should not turn on the existence of a "technical trespass." The ability of the landowner to contract with explorers for the privilege to conduct seismographic or other forms of a geophysical survey is a valuable expectancy worthy of protection.[21] Furthermore, when the economic consequences of a wrongful survey are considered, the landowner may be deprived of all prospective advantages arising out of the mineral estate.[22] A large part of what is considered valuable depends upon "probable expectancies."[23] As industry and technology become more complex, courts must be willing to protect these expectancies from undue interference.[24]

An initial discussion will briefly describe the processes of geophysical exploration and the character of the landowner's interests that may be effected by a surreptitious survey. This comment will demonstrate that the law traditionally has protected interests similar to the information derived from a geophysical survey. For example, the law of private nuisance has protected the landowner against intangible interferences with property rights,[25] although a tangible injury is generally required.[26] In addition, the right to privacy has rendered the individual secure from unwarranted intrusions[27] and publication of private facts.[28] These privacy protections, however, contemplate personal rather than property infringements.[29] The concept of "commercial privacy" remains to be developed.[30] Courts have guarded confidential commercial information from appropriation by unethical means,[31] while actively promoting commercial propriety through the law of trade

19. *See infra* notes 125-42 and accompanying text.
20. *See* HEMINGWAY, *supra* note 1, at §4.1.
21. *See infra* note 253 and accompanying text; *see also* 241 F.2d 586, 590 (public knowledge that the right to explore for minerals has a considerable monetary value).
22. *See infra* notes 125-42 and accompanying text.
23. Worldwide Commerce, Inc. v. Fruehauf Corp., 84 Cal. App. 3d 803, 811, 149 Cal. Rptr. 42, 47; W. PROSSER, TORTS 950 (4th ed. 1971).
24. PROSSER, *supra* note 23, at 950.
25. *Id.* at 591-602.
26. *See infra* notes 126-46 and accompanying text.
27. *See* PROSSER, *supra* note 23, at 807-09.
28. *Id.* at 809-12.
29. *See infra* note 190 and accompanying text.
30. *See infra* note 195 and accompanying text.
31. *See infra* notes 201-10 and accompanying text.

secrets.[32] Information concerning the mineral estate, however, does not constitute a trade secret.[33] Moreover, analogies to the law of trade secrets are necessarily restricted to intentional wrongdoing since the law protects against only unethical conduct.[34] While the advent of modern geophysical processes suggests a reduction in negligently conducted surveys,[35] appropriation may still occur through negligent operations.[36]

Although the tort theories noted above fail to provide the landowner with needed relief from the surreptitious geophysical survey,[37] these theories do provide insight into the nature of the interests involved, and guidance by analogy.[38] Moreover, the landowner may derive considerable benefit from application of the rapidly developing tort of interference with prospective economic advantage. This comment will suggest the viability of both the negligent and intentional aspects of the "interference tort" as a practical solution to the uncompensated deprivation of mineral estate information that occurs from outside physical property lines. First, however, the right to explore must be examined to comprehend fully the nature of the deprivation.

The Right to Explore

Some states follow the "oil and gas in place" doctrine,[39] which creates an estate in the oil and gas beneath the property similar to surface estates.[40] California, however, has rejected this doctrine.[41] Nevertheless, California recognizes the landowner has the exclusive right on his land to drill for and produce oil.[42] When granted by the landowner, the right is an interest in real property in the form of an incorporeal heraditament, *a profit prendre*.[43] Among the landowner's valuable oil and gas property interests is the right to explore for minerals on or below the property.[44]

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32. Kewanee Oil Co. v. Bicron Corp., 94 S.Ct. 1879, 1883 (1974).
33. *See infra* note 200 and accompanying text.
34. *See* Rice, *supra* note 6, at 64.
35. *See infra* notes 70-80 and accompanying text.
36. *See* Rice, *supra* note 6, at 64.
37. *See infra* notes 148-230 and accompanying text.
38. *See infra* notes 207-11 and accompanying text.
39. *See* Gerhard v. Stephens, 68 Cal. 2d 864, 878, 442 P.2d 692, 705, 69 Cal. Rptr. 612, 625 (1968).
40. *Id.*
41. Callahan v. Martin, 3 Cal. 2d 110, 117-18, 43 P.2d 788, 791-92 (1935).
42. Dabney-Johnston Oil Corp. v. Walden, 4 Cal. 2d 637, 649, 52 P.2d 237, 243 (1935).
43. *Id.*; 68 Cal. 2d at 872, 442 P.2d at 705, 69 Cal. Rptr. at 625. A *profit a pendre* is an interest in real property in the nature of an incorporeal heraditament. Whether the profit is unlimited as to duration, or limited to a term of years, it is an estate in real property. *Id.*
44. *See* Williams & Meyers, *supra* note 11, at §230.

Initially, the right to explore was nothing more than the right to ingress and egress from the property to be surveyed.[45] As geophysical methods have become more precise,[46] however, the right to explore has assumed greater importance.[47] Although the landowner possesses the exclusive right to explore,[48] the right may be severed from other oil and gas or mineral interests and sold separately,[49] or as a part of a larger oil and gas lease.[50] In exchange for the right to explore, the landowner generally receives sizeable consideration.[51] The amount is dependent upon a number of factors including the number of discoveries in the area,[52] the existence of similar situations elsewhere,[53] and the extent to which the geology of the region is known.[54] In an oil producing area, the value of the exploration right will increase proportionately to the likelihood of encountering oil.[55] The right to enter a landowner's property to conduct geophysical surveys is a valuable interest with an ascertainable market value.[56] Once the explorer has obtained the exploration privilege, many geophysical methods are available to aid the explorer in the search for oil.[57]

The Geophysical Process

"Geophysical exploration" refers to the scientific process used in the search for geologic structures that are or may be favorable to the production of oil and gas.[58] The process has become the universal prerequisite to exploratory drilling.[59] Furthermore, a person who has a lease obligation not only has a right, but also may be under

45. McRae, *Granting Clauses in Oil and Gas Leases: Including Mother Hubbard Clauses* 2 INST. ON OIL & GAS L. & TAX. 43, 93 (1951).
46. Telephone interview with Stephen W. Dana, Professor and Chairman of Geological and Geophysical Studies, University of Redlands (July 23, 1983, notes on file at *Pacific Law Journal*) [hereinafter cited as Dana].
47. *See* McRae, *supra* note 45, at 73; HEMINGWAY, *supra* note 1, at §4.1.
48. 199 So. 656, 658; HEMINGWAY, *supra* note 1, at §4.1.
49. Rice, *supra* note 6, at 56; *see* HEMINGWAY, *supra* note 1, at §4.1; *see also* Western Energy Co. v. Genie Land Co., 635 P.2d 1297, 1303 (1981) (the right of the mineral owner to conduct resource inventory operations as a part of the right to explore). Storm Assoc., Inc. v. Texaco, Inc.; 645 S.W.2d 579 (Tex. 1982) (construing right to explore).
50. Rice, *supra* note 6, at 56; *see* HEMINGWAY, *supra* note 1, at §4.1.
51. 241 F.2d 586, 590; 26 So. 2d 20, 22; *see* LEVORSEN, *supra* note 2, at 665-66.
52. *See* LEVORSEN, *supra* note 2, at 665-66.
53. *Id.*
54. *Id.*
55. *See id.*
56. WILLIAMS & MEYERS, *supra* note 11, at §230.
57. *See* LEVORSEN, *supra* note 2, at 612-15; SUMMERS, *supra* note 4, at §659; *see infra* notes 59-80 and accompanying text.
58. Shine, *supra* note 3, at 49.
59. *See* MANUAL, *supra* note 2, at 318.

a duty to use geophysical methods to explore leased lands.[60]

A host of scientific methods and devices may be engaged in the search for deposits of oil and gas beneath the crust of the earth.[61] By employing instruments that utilize gravity, vibration or sound, magnetism, and electricity, geological structures that have a high propensity for producing oil and gas can be located.[62]

A commonly used method of exploration involves the use of a seismograph that measures shock waves reflected and refracted by subterranean rock layers.[63] The velocity and character of earth vibrations created by a particular shock wave are recorded, and from these data, a contour map is plotted outlining the subsurface structures.[64] By using this map, certain structures having a propensity to produce oil and gas are pinpointed.[65] An added advantage of seismic mapping is the wide application to a variety of geological conditions leaving the geologist free to choose the formation boundaries to be surveyed.[66] The seismic survey depends upon the denotation of a dynamite charge to cause the necessary shock waves.[67] The seismograph, however, has been supplemented, and to some extent replaced, by the development of the "Vibroseize"[68] and the "Thumper,"[69] two devices which operate on similar principles.[70] Both of these newly developed devices give the explorer an increased level of accuracy and have all but eliminated the operator's concerns for physical destruction.[71]

The most accurate methods of subsurface mapping are also the most expensive.[72] Since the costs involved in geophysical exploration are prohibitive to the landowner,[73] or to the owner of a single lease, the

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60. *See, e.g.*, Yates v. Gulf Oil Corp., 182 F.2d 286 (Tex. 1950) (the lessor has the right to insist upon a fair and reasonable development in accordance with modern practices).

61. *See* LEVORSEN, *supra* note 2, at 612-15; SUMMERS, *supra* note 4, at §659; *infra* notes 59-80 and accompanying text.

62. SUMMERS, *supra* note 4, at §659.

63. MANUAL, *supra* note 2, at 318.

64. *Id.*

65. *See id.*

66. LEVORSEN, *supra* note 1, at 613-15.

67. SUMMERS, *supra* note 4, at §661.

68. Dana, *supra* note 46. The "Vibroseize" is a device employed by the larger oil companies and geophysical operators and operates upon similar principles sending vibrating waves through the earth's crust. *Id.*

69. *Id.* The "Thumper" is a geophysical device that involves the use of a heavy object which is repeatedly slammed against the earth's crust and gives off a measurable shock wave. *Id.*

70. *Id.* The "Vibroseize" and the "Thumper" have allowed geophysical operations to proceed without concern for the physical damages that haunted operations in the past. The "Vibroseize" has been found effective in surveying below public streets in urban areas. *Id.*

71. *Id.*

72. *Id., see* LEVORSEN, *supra* note 2, at 665.

73. 430 So. 2d 298, 301 n.2; 26 So. 2d 20, 22; *see* McRae, *supra* note 45, at 73; LEVORSEN, *supra* note 1, at 665-66.

bulk of geophysical operations are carried on by oil companies and independent geophysical operators.[74] In an area that has been subjected to extensive surveys, the costs of drilling will only be minor in comparison to the exploration costs.[75] While the exploration devices noted above are effective, they are far from being the exclusive methods.

Seismic surveys are often preceded by a form of detailed air reconnaissance.[76] The magnetometer, a geophysical device based on a magnetic measuring process, is effective in detecting oil and gas when employed from airplanes flying over the landowner's property.[77] Some geophysical operators adhere to the use of the torsion balance, an instrument that measures the direction and strength of the force of gravity.[78] Whatever the method employed, considerable technological advancements have occurred in recent decades.[79] Consequently, geophysical exploration has grown into an increasingly complex and profitable commercial enterprise.[80]

As a result of the relatively recent occurrence of geophysical exploration,[81] the law relative to an explorer's rights and liabilities is still in the formative stage.[82] Moreover, the landowner's protections against misappropriation of information regarding the quality of the mineral estate and the ensuing interference with prospective advantage are weakened by continued adherence to traditional trespass law.[83] To appreciate fully the significance of this weakness, a discussion of the surreptitious survey is necessary.

Geophysical Exploration Without Authorization

Statutory provisions in some states require a geophysical operator to obtain a permit before conducting geophysical surveys on public

74. McRae, *supra* note 45, at 73.

75. *See* Levorsen, *supra* note 2, at 665.

76. Dana, *supra* note 46; McRae, *supra* note 45, at 73.

77. *See* Shine, *supra* note 2, at 49. Professor Dana noted that the airborne magnetometer has been effective in uncovering anticlines and basement highs. Dana, *supra* note 46.

78. Summers, *supra* note 4, at 659.

79. Williams & Meyers, *supra* note 11, at §230; Note, *Oil and Gas: Improper Geophysical Exploration—Filling the Remedial Gap*, 32 Okla. L. Rev. 903, 903-04 (1979).

80. Note, *supra* note 79, at 904. For a discussion of the costs involved in a geophysical exploration, see Levorson, *supra* note 2, at 665.

81. Williams & Meyers, *supra* note 11, at §230; Rice, *supra* note 7, at 54. "Deeper and more costly drilling and generally higher exploration costs associated with more difficult targets have required the acquisition of even larger amounts of geophysical data. This had led to an emphasis on perfecting more reliable and faster acquisition techniques." *Id.*

82. Ready v. Texaco, Inc., 410 P.2d 983, 984 (Wyo. 1966).

83. *See* Hemingway, *supra* note 1, at §4.1; Rice, *supra* note 6, at 59; Note, *supra* note 79, at 914.

or private land.[84] California law prohibits the disclosure of information obtained from a geophysical survey on public lands and persons who violate the statutory provisions may be subjected to criminal sanctions.[85] Alternatively, the private landowner must resort to common-law protections to preserve the confidentiality of information regarding the mineral estate.[86] Inequities develop, however, when courts adhere to existing oil and gas tort theory and predicate recovery for losses incurred as a result of a surreptitious survey upon the existence of physical invasion.[87] To accentuate this disparity, this comment will briefly examine the extent of redress available under the theory of a "geophysical trespass."

A. Historical Background: The Geophysical Trespass

The geophysical trespass has been defined as the wrongful entry on land for the purposes of making a geophysical survey on the land.[88] Whether the invasion results from intentional disregard of the landowner's instructions or from boundary errors, a geophysical explorer who intrudes onto the premises can be held accountable for losses occasioned by the survey.[89] The courts have recognized that the geophysical trespass may interfere with a multitude of the landowner's interests.[90] As a result, the geophysical trespass has warranted a wide variety of recoveries. The landowner may recover from the explorer for the actual damage to the land,[91] including physical damages and the costs of restoring the condition of the land prior to the trespass.[92] Nevertheless, physical harm to the property, once the ma-

84. SUMMERS, *supra* note 4, at §659. The United States Department of the Interior has promulgated regulations for geophysical exploration of the "Outer Continental Shelf." *See, e.g.*, 30 C.F.R. §§251.12(b), 251.13, 251.146; *see also* Geophysical Corp. of Alaska v. Andrus, 453 F. Supp. 361 (Alaska 1978) (denial of geophysical company's claim that the regulations amount to a "taking" without just compensation).

85. CAL. PUB. RES. CODE §6826.

86. *See generally* Rice, *supra* note 6, at 57-65 (general discussion of common law remedies).

87. HEMINGWAY, *supra* note 1, at §4.1; SUMMERS, *supra* note 4, at §660.

> So long as no physical entry is made on the land of the complainant for the purposes of the survey, there is no liability incurred merely because the shock waves set off by the defendant in his survey pass through the complainant's land, even though the conduct of the survey affords (or is believed to afford) information concerning the structure underlying the complainant's land and the speculative value thereof is affected thereby.

WILLIAMS & MEYERS, *supra* note 11, at §230.

88. *See* HEMINGWAY, *supra* note 1, at §4.1; WILLIAMS & MEYERS, *supra* note 11, at §230; Rice, *supra* note 6, at 65-69.

89. HEMINGWAY, *supra* note 1, at §4.1.

90. *Id.*

91. *See, e.g.*, Dahl v. Petroleum Geophysical Co., 632 P.2d 1136, 1137-39 (Mont. 1981); *see also* Rice, *supra* note 6, at 65. Actual surface damage has been the type of damage most readily accepted by the courts. *Id.*

92. *See* SUMMERS, *supra* note 4, at §661.

jor concern of the geophysical explorer, is now of only minor importance.[93] Physical damages can be avoided by the use of modern surveying methods that cause little or no physical damage.[94] As a result, oil companies tend to be less concerned about obtaining a geophysical permit before conducting exploration since the use of a more obvious dynamiting procedure is not contemplated.[95] Consequently, the greatest concern of the landowner is the loss of prospective economic advantages.[96]

The landowner's major losses occur as a result of the misappropriation of information regarding the mineral estate.[97] The landowner is deprived of the valuable exploration right,[98] and if the survey tends to demonstrate the land is valueless for oil and gas purposes, the landowner may be denied the opportunity to lease or sell rights to the mineral estate.[99] One commentary has suggested that when the public knows a surreptitious survey has taken place, speculative value of the land is affected whether or not information concerning the results is made public.[100] If the explorer takes no action after the survey has been conducted, unfavorable data will be presumed, causing the same effect as drilling a dry hole.[101] In *Humble Oil & Refining Co. v. Kishi*,[102] the landmark case on destruction of speculative value,[103] the court held that a trespasser who entered and drilled a dry hole was liable to the property owner for the destruction of the speculative value of the land.[104] Whether the destruction of speculative value is caused by the drilling of a dry hole or by a geophysical survey, the landowner has been harmed.[105] Conversely, should the survey yield

93. WILLIAMS & MEYERS, *supra* note 11, at §230.

94. Dana, *supra* note 46. The concern over physical damages has diminished with the development of the "Vibroseize" and the "Thumper", two methods which have given the geophysical operator increased accuracy while causing little property damage. *Id.*

95. Dana, *supra* note 46. Geophysical operators now tend to be less concerned with obtaining a permit prior to conducting a survey. Professor Dana noted, however, that the reputable geophysical companies would gain a permit irrespective of the geophysical device employed. *Id.*

96. *See infra* notes 128-44 and accompanying text.

97. HEMINGWAY, *supra* note 1, at §4.1; Note, *supra* note 79, at 911-14.

98. HEMINGWAY, *supra* note 1, at §4.1.

99. *Id.*

100. WILLIAMS & MEYERS, *supra* note 11, at §230.

101. *Id.*

102. 276 S.W. 190 (Tex. 1925).

103. WILLIAMS & MEYERS, *supra* note 11, at §229; HEMINGWAY, *supra* note 1, at §4.1. Use of the term speculative value has led to confusion. "A close reading of the cases, however, indicates that at least where a specific sale is lost due to unauthorized geophysical operations recovery has been allowed." Rice, *supra* note 6, at 68.

104. 276 S.W. at 191.

105. *See, e.g.*, 26 So. 2d at 22. "So far as the speculative value of the land is concerned, this combination of events has virtually the same effect as the drilling of a dry hole in the *Kishi* case." WILLIAMS & MEYERS, *supra* note 11, at §230.

positive results which tend to demonstrate that certain land has a high propensity to produce oil, nondisclosure problems may arise in future negotiations between the explorer and landowner.[106] Hence, the need for flexibility in the construction of a remedy is manifest.

Courts have been flexible in the application of remedies for wrongful geophysical surveys when a physical entry is present.[107] Theories of recovery have been grounded in trespass, conversion, implied contract, and assumpsit.[108] The following types of damages have been suggested, dependent upon the particular facts and circumstances and the bona fide intent of the defendant: (1) the value of the right to enter on the land for the survey;[109] (2) the loss of speculative value by reason of unfavorable publicity resulting from the survey;[110] (3) the value to the trespasser of the information the operator obtained by the geophysical trespass;[111] and (4) a form of punitive damages when the trespass is in bad faith.[112]

As previously noted, however, the geophysical explorer need not enter upon the landowner's property to conduct an accurate survey.[113] Surveys may be successfully conducted from nearby lands, or from an airplane flying above the property. Absent a physical invasion, however, the landowner is denied recovery.[114]

B. Unauthorized Geophysical Exploration Absent a Physical Entry

The cases and commentators uniformly agree that when the geophysical explorer avoids making a physical entry onto the landowner's property to conduct an unauthorized geophysical survey, the explorer also escapes liability from the most severe consequences of the act.[115] Currently, the landowner cannot recover for the misappropriation of information, or receive compensation for destruction of speculative value.[116] The rationale for denying recovery is premised on the belief that seismic energy waves projected through the land

106. "Clearly the ability to make reliable predictions carries a tremendous economic advantage." Note, *supra* note 79, at 904; *see also* SUMMERS, *supra* note 4, at §662.

107. *See* Rice, *supra* note 6, at 57-65.

108. *See* HEMINGWAY, *supra* note 1, at §4.1; Shine, *supra* note 3, at 49; Rice *supra* note 7, at 57-65.

109. WILLIAMS & MEYERS, *supra* note 11, at §230.

110. *Id.*

Geophysical Trespasser and Negligent Geophysical Explorer, 29 TEX L. REV. 310, 317 (1951).

111. *Id.; see also* Hawkins, *The Geophysical Trespasser and Negligent Geophysical Explorer*, 29 TEX. L. REV. 310, 317 (1951).

112. WILLIAMS & MEYERS, *supra* note 11, at §230.

113. *See supra* note 17 and accompanying text.

114. WILLIAMS & MEYERS, *supra* note 11, at §230.

115. *See infra* notes 128-46 and accompanying text.

116. *Id.*

are not sufficient to constitute a physical invasion.[117] Recovery is denied even when the explorer deliberately projects shock waves through the land of another and picks them up on the opposite side,[118] or when the survey is conducted from an overflying airplane.[119] The need for an appropriate remedy, however, has not gone unnoticed.[120]

The Case for Recovery

When the geophysical explorer is dissatisfied with speculative evidence and conducts unauthorized geophysical surveys of the landowner's property, recovery should be allowed despite the lack of actual physical invasion.[121] As the scientific and technological processes involved in geophysical prospecting are refined and improved, the law must recognize the economic consequences that flow from the use of these processes.[122] In addition, the right to secure information concerning the mineral estate is neither uncertain,[123] nor prophetic.[124] Given the sensitive nature of oil and gas rights,[125] the landowner should also be protected against a negligently conducted survey.[126] For example, a negligent survey would encompass misappropriation of information occurring as a result of boundary errors or operational negligence.[127]

With the exception of the physical damage to the landowner's property, the injury suffered by an individual is potentially the same, with or without a physical invasion. The landowner will have lost the

117. *See, e.g.*, Kennedy v. General Geophysical Co., 213 S.W.2d 707, 712 (Tex. 1948); Hemingway, *supra* note 1, at §4.1. "[U]nwillingness to stretch the definition of trespass seems to be based on sound policy considerations, as the ramifications of such a holding would be far reaching. A mineral owner, for example, may be unable to develop his own property for fear that waves or vibrations from exploration or drilling activities would "escape" onto his neighbor's land." Rice, *supra* note 6, at 59.

118. *See, e.g.*, 213 S.W.2d 712-13.

119. *See* Hemingway, *supra* note 1, at §4.1; Shine, *supra* note 3, at 57; McRae, *supra* note 45, at 73.

120. No tort has been recognized as to invasion of privacy or for conversion of information to the mineral estate. Although such actions superficially fall into these categories, it would seem where valuable subsurface information has been obtained without actual entry upon the property, that recovery should be allowed. This would follow by viewing the acts as compromising a new tort or by extending the traditional scope of trespass to cover any type of energy were caused to pass through the property of another. In this situation the value of the exploration rights may be lost by the use of modern technology and it is ridiculous that the law not compensate for such taking by applications of archaic and outmoded concepts.

Hemingway, *supra* note 1, at §4.1; Kuntz, *supra* note 16, at §12.7; Note, *supra* note 79, at 913-14; *see also* Rice, *supra* note 6, at 70; Shine, *supra* note 3, at 58.

121. Hemingway, *supra* note 1, at §4.1; Note, *supra* note 79, at 913.

122. Note, *supra* note 79, at 903-04.

123. *See* McRae, *supra* note 45, at 73.

124. *Id.*

125. *See* Hemingway, *supra* note 1, at §4.1.

126. *Id.*; *see* Rice, *supra* note 6, at 64.

127. *Id.*

valuable exploration right.[128] Whether the geophysical exploration is conducted on or off the landowner's property or from the air, the information is valuable to the explorer.[129] If the existence of the survey is known, or if unfavorable contents of the survey are released, the landowner is harmed[130] since the owner may suffer the loss of all prospective advantage arising from the mineral estate. Furthermore, additional policy considerations are raised should the unauthorized geophysical survey yield information that suggests the existence of an oil producing formation.[131]

When a vendor and a purchaser of land deal at arm's length, the purchaser is under no duty to disclose the findings of the survey, or the fact that a survey has been conducted.[132] The sale of land is not fraudulent even though the purchaser knows that the vendor, through ignorance or mistake, is unaware of the special qualities of the land or its propensities for producing oil and gas.[133] The same result is reached when the nondisclosure is of a material fact and the landowner would not have made the sale at the stipulated price had he known of the special quality of the property.[134] The extraction of information about the mineral estate requires superior scientific knowledge and skill,[135] yet one commentator has suggested that the skill that enables a prospective lessee to acquire geophysical information is no different in principle from any other type of superior knowledge under which no duty to disclose arises.[136] The rationale in support of this rule is based upon the assumption that the vendor has the greatest opportunity to know the nature and value of his property.[137] This argument, however, fails to consider that the great majority of landowners will have no access to information pertaining to the subterranean resources.[138]

Resolving the inequitable nature of the existing situation depends

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128. HEMINGWAY, *supra* note 1, at §4.1. A geophysical survey conducted on or off the property is merely a difference in form. *See* Note, *supra* note 79, at 913.

129. Professor Dana suggested that the information may be accurate when taken from nearby lands and from the sky through the use of a magnetometer. Dana, *supra* note 46.

130. *See supra* notes 99-100 and accompanying text; HEMINGWAY, *supra* note 1, at §4.1.

131. *See infra* notes 132-36 and accompanying text.

132. *See* SUMMERS, *supra* note 4, at §662.

133. *Id.*

134. *Id.*; PROSSER, *supra* note 23, at 698.

135. *See* SUMMERS, *supra* note 4, at §662.

136. *See id.* at §662. The law in this regard may be undergoing some modification. PROSSER, *supra* note 23, at 698. Lack of knowledge affecting the market value of the seller's land might give rise to rescission. C.E.B. CALIFORNIA REAL PROPERTY REMEDIES PRACTICE (1982).

137. SUMMERS, *supra* note 4, at §662; *see, e.g.*, Kahn v. Lischner 128 Cal. App. 2d 480, 487, 275 P.2d 539, 543 (1954).

138. *See supra notes* 71-76 and accompanying text.

upon the development of a cause of action that will sufficiently protect the landowner from the initial misappropriation of information,[139] and insure recovery against the loss of prospective advantage one may suffer as a consequence of that appropriation.

As the technology used in the geophysical exploration process continues to be refined, and the scarcity of oil and gas escalates, the potential for abuse will increase proportionately.[140] Some commentators have recognized that the unauthorized survey, absent a physical invasion, lies at the peripheral edge of traditional tort concepts,[141] and the landowner is uniformly denied recovery. Other commentators have suggested that the appropriate remedy might lie in the expansion of the privacy tort[142] or by enlarging the definition of trespass to encompass high energy waves.[143] Additionally, the economic nature of the right to conduct geophysical surveys,[144] and the economic consequences that naturally ensue, have been noted.[145] Finally, the need to analogize to the tort theories that are designed to protect confidential information has been advocated.[146] Several theories will be explored in an attempt to further the landowner's case for recovery.

Similar Interests Protected

While the law of nuisance, the right to privacy, and the law protecting trade secrets are incapable of providing relief in their own right, their inadequacies and the similarity of interests that each protect suggest the need for an appropriate remedy. Significantly, California has been unique in its willingness to recognize and protect against unreasonable interferences with prospective economic advantage.[147] This comment will examine both the intentional and negligent fields of the "interference" tort, and appropriate elements for an intentional interference cause of action will be articulated. The discussion will first consider the protections provide by the law of private nuisance.

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139. *See supra* note 120 and accompanying text.
140. *See* Note, *supra* note 79, at 914.
141. Hemingway, *supra* note 1, at §4.1.
142. *See* Shine, *supra* note 3, at 57.
143. *See* Hemingway, *supra* note 1, at §4.1.
144. *See, e.g.*, 241 F.2d 586; Note, *supra* note 79, at 903-04.
145. 430 So. 2d 301 n.2. "[T]he right to geophysically explore land for oil, gas, or other minerals is a valuable right of the landowner since the average landowner lacks the means or funds to secure geophysical or seismographical information, and such information, if disseminated, could impair the landowner's ability to deal advantageously with his valuable mineral rights." *Id.*
146. Note, *supra* note 79, at 908.
147. *See, e.g.*, J'Aire Corp. v. Gregory, 24 Cal. 3d 799, 598 P.2d 60, 157 Cal. Rptr. 407 (1979); Chameleon Engineering Corp. v. Air Dynamics, Inc., 101 Cal. App. 3d 418, 161 Cal. Rptr. 463 (1982). California recognizes that both intentional and negligent forms of interference with economic advantage may be actionable. *Id.*

A. *Nuisance: Protection Against Intangible Interference*

The landowner originally was protected in the use and enjoyment of property against indirect interference by the action of trespass on the case.[148] The emphasis was not placed upon the mental state of the wrongdoer, but on the causal sequence of the harm inflicted.[149] California courts long ago abandoned the action of trespass on the case as antiquated.[150] The law of nuisance, however, has evolved to protect the landowner against "intangible interferences" with the use and enjoyment of property.[151]

A private nuisance has been defined as a nontrespassory invasion of another's interest in the private use and enjoyment of land.[152] Liability is predicated upon unreasonable conduct, both negligent and intentional.[153] Not every invasion, however, is actionable; the interference must be substantial.[154] Although a single act may constitute a nuisance,[155] conduct generally must be continuous and recurring to establish a course of conduct.[156]

The gravaman of an action for private nuisance is the invasion of some private property interest.[157] Activity most commonly amounts to a nuisance when an invasion results in actual physical interference with land.[158] Additionally, the owner occupying the premises is protected against impairment of the comfortable enjoyment of property.[159] While a trespass requires a physical entry to be actionable,[160] conduct may amount to a nuisance when no interference with the possessory interest[161] has occurred. A multitude of property rights may

148. Gallis v. Poulou, 140 Cal. App. 2d 638, 641-42, 295 P.2d 958, 959-60 (1956).
149. PROSSER, *supra* note 23, at 28-30.
150. 140 Cal. App. 2d at 641, 295 P.2d at 960.
151. *See* PROSSER, *supra* note 23, at 591-96.
152. RESTATEMENT (SECOND) OF TORTS §821D (1979).
153. *Id.* at §822.
154. See PROSSER, *supra* note 23, at 578. When invasions affect the physical condition of the plaintiff's land the substantial character of the interference is seldom in doubt. When there is no physical injury, however, the nuisance must affect the ordinary comfort of the human existence. *Id.*
155. *Id.*
156. *See id.* at 579. "Some continuity or recurrence of interference should exist in any event to demonstrate a course of conduct as contrasted to an isolated act. The isolated act if committed with an intent to harm an adjoining landowner should be governed by the principles of trespass even though the medium of intrusion be only shock waves or smoke." CASNER, *supra* note 13, at §28.25.
157. RESTATEMENT (SECOND) OF TORTS §821E comment (a). "The liability for private nuisance exists only for the protection of persons having 'property right and privileges' . . . ." *Id.*
158. *See* B. WITKIN, SUMMARY OF CALIFORNIA LAW, *Nuisance* §94, at 5316-17 (8th ed. Supp. 1982).
159. *Id.*
160. Wilson v. Interlake Steel Co., 32 Cal. 3d 229, 231-35, 649 P.2d 922, 924-25, 185 Cal. Rptr. 280, 282-83 (1982); RESTATEMENT (SECOND) OF TORTS, §821D comment (d).
161. RESTATEMENT (SECOND) OF TORTS §821D comment (d).

support an action for private nuisance, including easements and profits in the land.[162] The owner of a profit, however, is protected against a private nuisance only to the extent to which his profit is affected.[163]

The phrase "use and enjoyment" has been construed broadly and comprehends not only actual *uses* but also the landowner's interest in having the present value unimpaired by changes in the *physical* condition.[164] Although changes in the physical condition of property may result from a surreptitious survey,[165] this comment is concerned with the substantial losses the landowner may suffer irrespective of the physical destruction of land.

The property owner's "actual present uses" contemplate residential, agricultural, commercial, industrial, and mineral uses.[166] Recovery in nuisance may be predicated upon intangible interferences including those created by sound waves, odors, and dust.[167] A recent California case indicates that while energy waves do not constitute a trespass, they may amount to a nuisance.[168] The energy waves used in an unauthorized geophysical survey, therefore, arguably amount to a substantial interference with the landowner's right to the use and enjoyment of minerals below the surface, or more specifically, the right to explore.

As a practical matter, the use and the enjoyment of oil and gas by a landowner generally is dependent upon having the exploration and drilling done by oil companies.[169] The landowner derives his ma-

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162. *Id.* at §821E.

163. *Id.* at §821E comment (a), (e). "One who has a profit in the minerals in a parcel of land has 'property rights and privileges' in the land but can complain of an interference with the land or its use only if the minerals or his use and enjoyment of them are affected." *Id.* at comment (a).

> The owner of an easement or a profit in the land has an interest in the land but his rights and privileges with respect to use and enjoyment are limited. Hence, he can maintain an action under the rule stated in §822 only when the particular use and enjoyment of the land to which his easement or profit entitles him is interferred with.

Id. at comment (e).

164. *See* PROSSER, *supra* note 23, at 591. RESTATEMENT (SECOND) OF TORTS §821(D) comment (b); "Actual physical interference with land use constitutes the most obvious and common type of nuisance." WITKIN *supra* note 158, at 5316.

165. *See* WILLIAMS & MEYERS, *supra* note 11, at §230.

166. RESTATEMENT (SECOND) OF TORTS §821(D) comment (b).

> The phrase interest in the use and enjoyment of land is used in this Restatement in a broad sense. It comprehends not only the interests that a person may have in the actual present use of land for residential, agricultural, commercial, industrial and other purposes, but also his interest in having the present use value of the land unimpaired by changes in the physical condition.

Id.

167. *See* WITKIN, *supra* note 158, at 5317-18.

168. 32 Cal. 3d at 232, 649 P.2d at 925 (emission of sound waves may amount to a nuisance).

169. *See* 26 So. 2d at 22; LEVORSEN, *supra* note 1, at 665-66.

jor benefits from the leasing process.[170] Once the exploration rights and the ability to lease have been virtually destroyed by a surreptitious survey, the landowner's oil and gas uses will be of little worth.[171] Therefore, an actual use of the property would be adversely affected.

Nuisance law, however, traditionally has required a tangible injury that results in physical damage, or that renders the property uncomfortable or inconvenient.[172] To constitute a traditional nuisance, the character of the harm must be an appreciable, substantial, and tangible injury to either the physical condition of the land or the health and comfort of those who are affected by the particular conduct.[173] Moreover, an interference with the pleasure derived from the occupancy of land must result in actual, material, and physical discomfort.[174] Although the depreciation of the market and rental value of property are properly considered in computing damages for an established nuisance, the surreptitious survey would have to result in more than diminution of property values to be actionable as a nuisance.[175] Recovery for damages resulting from vibration of the land in the course of the survey is denied in the absence of appreciable physical injury on the basis that no violation of an absolute right has occurred.[176] Furthermore, recovery under a nuisance theory would be subject to the same criticism of excessive liability that has weighed against the expansion of the geophysical trespass theory.[177] The landowner, therefore, probably could not obtain adequate legal redress under a nuisance theory for the multitude of injuries suffered when no physical impairment of land results from the survey. Although the law of nuisance does not provide the proper tool for structuring an appropriate form of recovery, the interests impinged upon by an unauthorized survey are directly related to the landowner's use and enjoyment of the mineral estate and should not continue to be unprotected.

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170. *See, e.g.*, 26 So. 2d at 22; Rice, *supra* note 6, at 66.

171. *See* HEMINGWAY, *supra* note 1, at §4.1.

172. 213 S.W.2d at 711. There is no liability for seismic vibrations of land as a nuisance in the absence of actual injury. *Id. See* CASNER, *supra* note 13, at §28:25; RESTATEMENT (SECOND) OF TORTS §827 comment (d); WITKIN, *supra* note 158, at 5315-18.

173. RESTATEMENT (SECOND) OF TORTS §827 comment (d). "The harm that one suffers from an interference with his use or enjoyment of land may arise out of physical damage to the land or to the vegetation, buildings and other things on it; or it may rise out of personal discomfort or annoyance." *Id.*

174. *Id.*

175. *Id.* The courts have been reluctant to relieve against activities that merely reduce the market value of property. CASNER, *supra* note 13, at §28:22.

176. SUMMERS, supra note 4, at §660.

177. See supra note 117 and accompanying text.

The need for a theory of recovery that focuses on the nature of the deprivation rather than on the invasion of property rights is manifest.

Another possible theory implicated by the electronic and informational aspect of the surreptitious survey is the right to privacy. The protections afforded by privacy rights safeguard the individual against unwarranted intrusions and disclosures of private information.[178] One commentator has suggested that a privacy right could be developed to protect the landowner from the misappropriation of mineral estate information.[179]

B. Rights of Privacy

The right to privacy is recognized as an inalienable right under the California Constitution.[180] Generally, four separate areas of the privacy tort are recognized, two of which are relevant to this discussion. One of these areas is the individual's right to be free from unwarranted intrusions.[181] The interest protected is the plaintiff's physical solitude or seclusion.[182] The right to physical solitude has grown with the increasing capability of electronic devices,[183] and recovery for an invasion of this interest has extended beyond physical invasions.[184]

If the process of the geophysical survey actually intrudes upon the individual's seclusion, the landowner might recover for the disruption of his solitude.[185] Modernly, however, due to recent advances in geophysical exploration, the landowner may be unaware that the survey has taken place.[186] Therefore, the disruption of physical solitude and seclusion would be minimal. When the informational aspect of the geophysical survey is considered, however, an interest analogous to another privacy protection is raised.

The right to privacy also protects the individual against public disclosure of private facts.[187] When the geophysical operator publishes the results of a survey, an interest closely related to an individual's

178. *See supra* note 182 and accompanying text.
179. *See* Shine, *supra* note 3, at 57.
180. CAL. CONST. art. I, §1.
181. *See* PROSSER, *supra* note 23, at 802-18.
182. *Id.* at 807.
183. *Id.*
184. *Id.; see* WITKIN, *supra* note 158, at 2599.
185. PROSSER, *supra* note 23, at 807. Generally, any objectionable disruption and intrusion into the plaintiff's solitude and seclusion would be actionable. Thus, if the dynamiting process utilized in seismic mapping intruded on the plaintiff's seclusion, the conduct would appear actionable. Recovery, however, would be measured by the disruption of privacy. *Id. See also* 430 So. 2d 298 (action for mental distress).
186. Dana, *supra* note 46.
187. *See* PROSSER, *supra* note 23, at 809.

right to be free from public disclosure of private facts is raised. Once a geophysical survey has been conducted, the explorer has no interest in keeping negative information confidential. Geophysical information concerning a parcel of land may be disseminated through business channels, employee leaks,[188] or by publication of survey results.[189] Although the tort is concerned with protecting the individual from the publication of *personal* facts,[190] publication of *economic* facts that reflect upon the individual's character has been recognized as sufficiently intrusive to warrant recovery,[191] even when no action for defamation would lie.[192]

Arguably, the disclosure of negative information concerning the mineral estate would be offensive to a reasonable person.[193] The confidential nature of information regarding the mineral estate has been noted consistently, yet no corresponding privacy right has been recognized.[194] The notion of "commercial privacy" remains to be developed.[195] Furthermore, the disclosure must be public rather than private to be actionable.[196] Disclosure to a small group of individuals will not suffice, absent a confidential relationship.[197] In addition, damages based upon a disruption of the plaintiff's personal solitude cannot adequately compensate the landowner for economic deprivations that result from the surreptitious survey.[198] Therefore, reliance upon this aspect of the right to privacy is undesirable. Nevertheless, the individual's privacy protection against intrusion and publication of private facts implicates the need for protection when confidential economic information is extracted from beyond property lines by the use of modern technology. Courts have had some success protecting confidential information in the business context while simultaneously advancing ethical commercial conduct through the law of trade secrets.[199]

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188. *See e.g.*, Ohio v. Sharp, 135 F.2d (10th Cir. 1943) (involving an employee leak); Dana, *supra* note 46.

189. *See, e.g.*, 26 So. 2d 20, 23.

190. *See* PROSSER, *supra* note 23, at 809-10.

191. *See, e.g.*, Timperly v. Chase Collection Serv. 272 Cal. App. 2d 697, 700, 77 Cal. Rptr. 782, 783 (1969).

192. *See* PROSSER, *supra* note 23, at 809.

193. *See id.* at 809-810. The offensiveness of the disclosure is a required element of the privacy tort. *Id.*

194. *See* HEMINGWAY, *supra* note 1, at §4.1; *see also* Shine, *supra* note 3, at 57.

195. *See* Note, *supra* note 79, at 912-36.

196. Schwartz v. Thiele, 242 Cal. App. 2d 799, 805-806, 51 Cal. Rptr. 767, 771 (1966); *see* PROSSER, *supra* note 23, at 810. *But see* Kinsey v. Macur, 107 Cal. App. 3d 265, 272, 165 Cal. Rptr. 608, 612 (1951).

197. *See* PROSSER, *supra* note 23, at 810.

198. *See supra* notes 132-146 and accompanying text.

199. *See* Note, *supra* note 79, at 914.

C. Protection of Trade Secrets: Promotion of Commercial Propriety

One commentator recently suggested that courts should discard the trespass theory and consider the laws protecting confidential information to provide the landowner with recovery for the loss of exploration rights.[200] The author posited that the economic and informational aspects of a geophysical survey would provide a proper basis for an analogy to the law of trade secrets.[201]

Generally, trade secrets encompass information neither copyrighted nor patented[202] and is defined as "any formula, pattern, device or compilation of information which is used in one's business, and which gives one an opportunity to obtain an advantage over competitors who do not know or use it."[203] The definition contemplates a form of intellectual property previously reduced to possession[204] and which is the result of hard work, invention, or business expertise.[205] The law thus protects the fruits of labor that are confidential, although not subject to patent protection.[206] The right to information concerning the quality of the landowner's mineral estate does not meet the trade secrets definition.[207] Moreover, the geophysical explorer and the landowner are not commercial competitors. Nevertheless, the policy that motivates the law may provide guidance by analogy. The law of trade secrets seeks to protect confidential business information while promoting commercial propriety.[208] When the subject of a trade secret is confidential, the law provides protection against disclosure or use when the knowledge is gained by "improper means."[209] The courts have promoted higher standards of commercial morality in the business world by imposing a duty upon those conducting business to act in good faith and with ethical propriety.[210]

The keystone to trade secret protection is the misappropriation by "improper" or "unethical"[211] means. "Improper" has been broadly construed, and includes conduct that falls below generally accepted

200. *Id.*
201. *Id.*
202. *See* WITKIN, *supra* note 158, at 5305.
203. RESTATEMENT (FIRST) OF TORTS §757 (1939) (this section was omitted from the coverage of RESTATEMENT (SECOND) OF TORTS).
204. Note, *supra* note 79, at 909 n.21.
205. *See* C.E.B., ATTORNEY'S GUIDE TO THE LAW OF COMPETITIVE BUSINESS PRACTICE §2.1 (1982 Supp.).
206. WITKIN, *supra* note 158, at 5305.
207. *See* Note, *supra* note 79, at 909.
208. Sarkes Tarzian Inc. v. Audio Devices Inc., 166 F. Supp. 250, 259 (1960); *see* C.E.B., TRADE SECRETS §1.8 (1971).
209. Kewanne Oil Co. v. Bicron, 94 S.Ct. 1879, 1883 (1974).
210. *See* TRADE SECRETS, *supra* note 202, at §1.8.
211. 94 S.Ct. at 1883.

standards of commercial morality.[212] The term comprehends theft, wiretapping, and aerial reconnaissance.[213] Conduct that might not be actionable in its own right may be actionable when that conduct is directed at obtaining secret information.[214]

In a trade secret case remarkably similar to geophysical exploration by magnetometer conducted from an airplane flying over the property, the court in *E.I. duPont de Nemours & Co. v. Christopher*[215] considered the defendant's aerial photography of plaintiff's manufacturing process.[216] The defendant had hired aerial photographers to capture the plaintiff's unpatented process for producing methanol.[217] The plaintiff's plant was still under construction, and the manufacturing process was exposed to aerial view.[218] The court found the defendant's conduct to be an "improper" means of acquiring information.[219]

Although not a trade secret, mineral estate information is confidential and may be used both to the detriment of the landowner and the benefit of the misappropriator.[220] In view of these similarities, an analogy to the law of trade secrets should be drawn when courts determine what means are improper in the acquisition of information pertaining to the mineral estate.[221]

Good faith and honest fair dealing are the mainstay of the commercial world.[222] These interests are no less deserving of promotion when confidential information, although not a trade secret, is misappropriated by unethical means. Like a business competitor who misappropriates a trade secret, the explorer who conducts an unauthorized survey may use the information to his economic benefit at the expense of the landowner.[223]

Adverse economic consequences invariably flow from the unauthorized exploratory activities.[224] When the geophysical explorer proceeds

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212. E.I. duPont de Nemours & Co. v. Christopher, 431 F.2d 1012 (1970).
213. *Id.*
214. *Id.*; RESTATEMENT (FIRST) OF TORTS §757 comment (1)f.
215. 431 F.2d at 1012.
216. *Id.* at 1013.
217. *Id.*
218. *Id.*
219. *Id.* at 1016-17.
220. *See* Note, *supra* 79, at 912.
221. *Id.*
222. 94 S.Ct. at 1885.
223. 26 So. 2d at 22.
> If the information thus obtained is favorable, it can be used and is used in dealing with the landowner for his valuable mineral rights . . . . If the information be unfavorable the fact becomes quickly publicly known and thus impairs the power of the landowner to deal advantageously with his mineral rights.

Id.
224. *Id.*

with a survey, the landowner suffers a lack of compensation for the surveys conducted. Meanwhile, the explorer has acquired valuable private information without being required to compensate the landowner. The geophysical information, if favorable for production of oil and gas, and if the secrecy of the survey is maintained, will lead to unequal bargaining positions since the operator is under no duty to disclose the existence of the survey or its contents.[225] Furthermore, information that is compiled from a geophysical survey is often inaccessible to the landowner because the survey is cost prohibitive.[226] Conversely, if the information released is unfavorable and tends to show the land is worthless for oil and gas purposes, the landowner may suffer the loss of speculative or lease value.[227]

The law of trade secrets does not prohibit discovery by fair and honest means,[228] or extrapolation by reverse engineering.[229] A geophysical explorer should be allowed to accumulate indirectly information with respect to the mineral estate by the correlation and extrapolation of data gathered from the surrounding area. When, however, the explorer directly conducts unauthorized subsurface mapping of the landowner's mineral estate, recovery should not be denied merely on the basis that no physical invasion has taken place.

Although the right to information concerning the mineral estate does not constitute a trade secret, the principles of commercial propriety lie at the core of our market system and are equally applicable when the extraction of geophysical information occurs by improper methods. The policies that motivate the law of trade secrets may guide the courts in construing an appropriate landowner remedy. An analogy drawn to the law of trade secrets, however, is necessarily incomplete. Since the law of trade secrets emphasizes intentional conduct, the theory is of little assistance in evaluating a negligent geophysical survey that results from boundary errors or from operational negligence. The goal of commercial propriety has also been advocated by courts in a separate but related tort field. California law protects against unscrupulous business practices and the deprivation of commercial expectancies resulting from both intentional and negligent conduct through the tort of interference with prospective advantage.[230] This discussion will now turn to an examination of the "interference" tort.

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225. *See supra* notes 132-33 and accompanying text.
226. *See supra* notes 70-74 and accompanying text.
227. *See supra* notes 128-31 and accompanying text.
228. 94 S.Ct. at 1883.
229. *Id.* Reverse engineering is the process of starting with a known product and working backward to divine the process which aided in its development or manufacture. *Id.*
230. *See* WITKIN, *supra* note 158, at 2643-47.

INTERFERENCE WITH PROSPECTIVE ADVANTAGE

Tort liability for interference with prospective advantage developed at an early date.[231] The law, however, is still in the formative stage,[232] and the cases applying the tort are difficult to classify.[233] Nevertheless, the case law is developing at a rapid rate. The interest protected by the tort is the reasonable expectation of economic advantage.[234] The tort is broad enough to impose liability for interference with business relations or advantages that are merely prospective and not the subject of an existing contract.[235] Legal redress is available for both negligent and intentional interferences with prospective advantage.[236] The discussion that follows will first consider those deprivations caused by intentional conduct.

A. Intentional Interference

Intentional interference with prospective advantage guards against wrongful conduct that would deprive an individual of economic expectancies.[237] The "wrongful conduct" consists of intentional and improper methods of diverting or taking business from another by unprivileged methods.[238] As a general rule, recovery for interference with prospective advantage is subject to the limitation that no action exists when the defendant's conduct is privileged.[239] Determining whether the conduct is privileged essentially is an inquiry into whether the conduct of the actor was fair and reasonable under the circumstances, and depends upon balancing social and private interests.[240] The objective advanced by the interference is balanced against the importance of the interest affected.[241]

Recovery generally is dependent upon the interplay of several factors and is not reducible to a single rule.[242] Similar to the law of trade secrets, however, most of the decisions turn upon the improper or wrongful motive or purpose of the defendant.[243] Any manner of in-

231. For a geneal discussion of the tort background, see PROSSER, *supra* note 23, at 949.
232. *See* WITKIN, *supra* note 158, at 2643.
233. *Id.*
234. Worldwide Commerce Inc. v. Frueheuf Corp., 84 Cal. App. 3d 803, 808, 149 Cal. Rptr. 42, 45 (1978).
235. Buckaloo v. Johnson, 14 Cal. 3d 815, 822, 537 P.2d 865, 869, 122 Cal. Rptr. 745, 749 (1975).
236. *See supra* notes 239-89 and accompanying text.
237. 84 Cal. App. 3d at 808, 149 Cal. Rptr. at 45.
238. *Id.*
239. Lowell v. Mother's Cake & Cookies Co., 79 Cal. App. 3d 13, 18, 144 Cal. Rptr. 664, 668.
240. *Id.* at 20-21, 144 Cal. Rptr. at 667-68.
241. *Id.*
242. *Id.*
243. *Id.* at 18, 144 Cal. Rptr. at 668; *see also* PROSSER, *supra* note 23, at 952-53.

tentional and improper deprivation or diversion of business from another that is not within the privilege of fair competition is actionable.[244] Furthermore, liability has been imposed for intentional interferences even when the conduct is not tortious or unlawful in itself.[245]

In *Lowell v. Mother's Cake & Cookies Co.*,[246] the plaintiff owned a trucking firm and derived a large amount of his business from a contract with the defendant.[247] The plaintiff sought to sell the business, but the defendant informed prospective purchasers that the existing contract would be terminated upon any sale of the business.[248] The value of plaintiff's business was depressed and the defendant later purchased the business substantially below market value.[249] The defendant advanced the argument that when the means utilized were entirely proper and lawful, the improper motive or purpose was irrelevant.[250] The court, however, disagreed and found that the plaintiff stated a cause of action for intentional interference.[251]

As the previous sections have demonstrated, the surreptitious geophysical survey is the type of improper conduct to be guarded against by the "interference" tort. Intentionally proceeding with a geophysical survey without proper authorization from the landowner and by conducting the survey from nearby lands is the type of improper, unfair, and unethical trade practice against which the interference tort should protect. *E.I. duPont de Nemours & Co. v. Christopher*, previously noted, indicates that extraction of confidential information concerning the mineral estate by use of air reconnaissance devices would be an improper method of appropriation.[252]

The landowner's right to contract for the sale of the opportunity to explore the land is a prospective advantage, as is the landowner's right to enter into subsequent oil and gas leases.[253] When an operator chooses to act without proper authorization, the landowner is injured.

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244. 79 Cal. App. 3d at 18, 144 Cal. Rptr. at 668.
245. *Id.* at 20, 144 Cal. Rptr. at 669.
246. *Id.* at 13, 144 Cal. Rptr. at 664.
247. *Id.* at 19, 144 Cal. Rptr. at 668-69.
248. *Id.*
249. *Id.*
250. *Id.* at 20, 144 Cal. Rptr. at 669.
251. *Id.* at 22, 144 Cal. Rptr. at 671.
252. 431 F.2d at 1012; *see supra* notes 215-21 and accompanying text.
253. The California Supreme Court has recognized a cause of action for intentional interference with prospective advantage involving real estate sales. 14 Cal. 3d 815, 823-27, 537 P.2d 865, 870-73. The landowner's right to dispose of or lease property is a prospective advantage that the law has protected by the interference tort. *See, e.g.*, Cooper v. Steen, 318 S.W.2d, 750, 757 (Tex. Civ. App. 1958). *See also* Solberg v. Sunburst Oil & Gas Co., 246 P. 168, 177 (1926) (interferencee with the rigths to enter into an oil and gas lease).

The surreptitious survey interferes with the landowner's ability to contract for the sale or lease of the exploration rights.[254] Once the survey has been conducted, the landowner will have lost the value of those exploration rights.[255] Moreover, that loss may be compounded by publication or business disclosures that may deprive the property owner of the speculative or lease value of the land, or result in an unequal bargaining position and lost profits for the landowner.[256]

An adequate remedy is required to compensate the landowner for the loss of prospective advantage suffered in a particular case. When the interference results in a pecuniary loss, the landowner should be allowed legal redress if (1) the explorer intentionally proceeds with a geophysical survey of the plaintiff's land without authorization, and (2) an actual exploration of the property is conducted. The first element focuses upon the mental state of the defendant and would establish the existence of an improper motive. The second element would require proof of actual exploration. Actual exploration, however, would not encompass the defendant's ability to construct maps by extrapolation from known data. By requiring the existence of these two elements, a balance is achieved that protects the landowner against an authorized survey, yet allows the explorer to compile data by extrapolation.

Measuring the pecuniary loss suffered as a result of the tortious interference with prospective advantage generally amounts to a showing of lost profits.[257] When the geophysical operator conducts a survey of the landowner's property, the existence of the survey should amount to prima facie evidence of a prospective advantage since the operator was sufficiently interested in the property to expend the time, effort, and money to conduct the survey. The reduction in profits must be established with reasonable certainty.[258] When the landowner makes an adequate showing, existing oil and gas law would provide guidelines for the computation of damages in a given case. The landowner's lost profits might be measured by any of the following methods: (1) the value of the right to enter on land for the survey,[259] (2) the loss of speculative or lease value,[260] or (3) the difference between the price

254. *See supra* notes 128-36, 253 and accompanying text.
255. *See supra* note 253 and accompanying text.
256. *See supra* note 128 and accompanying text.
257. *See* 79 Cal. App. 3d at 19-20; Union Oil Co. v. Oppen, 501 F.2d at 570.
258. 501 F.2d at 570. The court need not be absolutely certain that a prospective advantage exists, a reasonable certainty is sufficient. 318 S.W.2d 957.
259. *See supra* notes 107-15 and accompanying text.
260. *See supra* notes 107-14 and accompanying text.

paid and actual fair market value.[261] The ultimate goal is to make the landowner whole for the deprivation occasioned by the defendant.[262] If the defendant's conduct is sufficiently culpable, punitive damages should be awarded.[263] When the interference results from negligently conducted exploration activities, the landowner can be afforded legal redress under the negligence aspect of the tort.

B. *Negligent Interference*

As technology continues to improve and geophysical survey methods become more refined, negligent operations will become less frequent. Regardless of the infrequency, however, recovery should be allowed for negligent geophysical operations. Negligent interference with prospective advantage is recognized in California,[264] and like the intentional counterpart, provides legal redress to make the landowner whole for the injuries inflicted by a surreptitious geophysical survey.

The tort of negligent interference is based on the premise that a person conducting a business enterprise should do so in a reasonably prudent manner.[265] An individual should not be permitted negligently to inflict commercial injuries upon another.[266] In the recent case of *J'Aire Corp v. Gregory*,[267] the California Supreme Court recognized a cause of action for negligent interference with prospective economic advantage.[268] The case concerned a building contractor's liability to a third party tenant for lost profits caused by building delays.[269] In finding that a cause of action was stated, the court developed a "nexus" test that limits recovery to those instances when (1) the risk of harm is foreseeable, (2) the harm is closely related to the defendant's conduct, (3) damages are not wholly speculative, and (4) the injury is not part of the plaintiff's ordinary business risk.[270]

The court sought to ensure that these criteria were met by applying

261. *Id.*
262. *Id.*

> It is a fundamental and cardinal principle of the law of damages that the injured party shall have compensation for the injury sustained. The injured party is entitled to recover full indemnity for his loss, and to be placed as nearly as may be in the condition which he would have occupied had he not suffered the injury complained of. No measure of damages which does not afford just compensation for the loss sustained can stand the fundamental test.

Shell Petroleum v. Scully, 71 F.2d 772, 775 (5th Cir. 1934).

263. *See supra* notes 107-14 and accompanying text.
264. *See infra* note 267 and accompanying text.
265. *See* 501 F.2d at 568-70.
266. *Id.*
267. 24 Cal. 3d 799, 598 P.2d 60, 157 Cal. Rptr. (1979).
268. *Id.* at 808, 598 P.2d at 65-66.
269. *Id.*
270. *Id.*

the factors set forth in *Biakanja v. Irving*[271] to determine whether a particular defendant owes a duty to the plaintiff to refrain from negligent conduct. *Biakanja* was an attorney malpractice action brought by a party not in contractual privity with the attorney defendant.[272] The factors delineated in *Biakanja* for determining whether a duty is owed included: (1) the extent to which plaintiff was intended to be affected; (2) the foreseeability of harm to the plaintiff; (3) the degree of certainty that the plaintiff suffered injury; (4) the closeness of the connection between the defendant's conduct and the injury; (5) the moral blame attached to the defendant's conduct, and (6) the policy of preventing future harm.[273] While the recent cases allowing recovery have heavily weighed the foreseeability factor,[274] these broad criteria would enable a court to properly consider all relevant evidence in a particular case.[275]

In most instances, a negligent geophysical survey would fall within the "nexus" requirement. The paramount consideration of foreseeability heavily weighs toward imposition of liability upon the negligent geophysical explorer. Given the sensitive nature of oil and gas rights and the importance of geophysical surveys in the exploration process, harm to the landowner is highly foreseeable, if not an absolute certainty. Furthermore, the landowner may be equally harmed by a negligent or intentional unauthorized survey.[276] The loss of exploration rights as well as speculative value is directly attributable to the wrongful survey. The rights involved have an ascertainable value.[277] Certainly, the misappropriation of information pertaining to the mineral estate and the negative consequences that ensue cannot be characterized as an "ordinary business risk." An explorer should be aware of the possible consequences occasioned by his negligent conduct. Courts should provide a remedy when he is not.

Negligent interference has been criticized on the grounds that recovery for negligently inflicted injuries would encourage fraudulent and collusive claims.[278] Furthermore, critics argue that damages are too speculative.[279] Arguments against recovery for negligent interference have also been advanced by those who believe that recognizing the

271. 49 Cal. 2d 647, 320 P.2d 16 (1958).
272. *Id.* at 647-49, 30 P.2d at 18-19.
273. *Id.*
274. 24 Cal. 3d at 806, 598 P.2d at 64. "Foreseeability of the risk is a primary consideration in establishing the element of duty." *Id.*
275. *Id.*, 598 P.2d at 65.
276. Rice, *supra* note 6, at 64.
277. WILLIAMS & MEYERS, supra note 11, at §230.
278. 24 Cal. 3d at 806, 598 P.2d at 65.
279. *Id.*

tort would open the door to excessive liability and create an undue burden on freedom of action.[280] These arguments are unpersuasive in the geophysical exploration context. The difficulty in discovering whether a surreptitious survey has taken place and the burden of proving that the landowner's property has been the subject of that survey will discourage fraudulent and collusive claims.[281] When the landowner shows lost profits to a reasonable certainty, the damages will be of fixed and ascertainable value. Generally, damages might consist of the loss of the exploration right, or loss of the speculative or lease value. A value can be placed upon these injuries by conducting comparisons to similar circumstances. [282] Furthermore, inequities created by purchaser nondisclosure can be alleviated by measuring the difference between the purchase price and the fair market value of the property.[283]

The strongest argument against recovery for negligent interference is that excessive liability will create an undue burden on the defendant's conduct.[284] As the science of geophysics becomes more refined and the measuring processes more exact, the occurrence of a negligently conducted survey should be the exception, rather than the rule.[285] In addition, modern geophysical devices like the "Vibroseize" do not contemplate obvious exploration procedures.[286] The landowner will be hard pressed to even discover the existence of the survey.[287] The difficulty in discovery and proof make the argument of excessive claims unpersuasive. Furthermore, the landowner's exploration rights will be lost regardless of whether the survey was performed in bad faith or in error.[288] The defendant cannot plead excessive liability where he proceeds with an unauthorized survey knowing of the sensitive nature of oil and gas rights. Finally, the factors enumerated and applied in *J'Aire*, along with general negligence principles, are sufficient to limit

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280. *Id.*

281. McRae, *supra* note 44, at 73; Dana, *supra* note 46. "The possibility of detecting the air-borne geologist is very slight." McRae, *supra* note 45, at 73. Professor Dana noted that discovery of a surreptitious survey conducted with the aid of modern devices would be difficult to detect. Dana, *supra* note 46.

282. WILLIAMS & MEYERS, *supra* note 11, at §230.

283. The court computed profits in terms of the depressed price of plaintiff's business and the true fair market value. 79 Cal. App. 3d at 20.

284. *See* Note, 34 HARV. L. REV. 444, 448 (1974).

285. Shine, *supra* note 3, at 62. *But see* Rice, *supra* note 6, at 64.

286. *See supra* notes 68-71 and accompanying text.

287. *See supra* note 281 and accompanying text.

288. See Rice, *supra* note 6, at 64. The exploration right is lost when the date concerning the mineral estate are compiled and the nature and quality of the estate are no longer a mystery. It hardly matters to the landowner that the loss has occurred through negligent rather than intentional conduct. *Id.*

recovery without the drastic consequences of an absolute bar to suits for negligent injuries.[289] The following section will demonstrate that the economic injuries occasioned by the negligent geophysical survey should be allocated to the explorer.

C. Allocation of Liability

A number of scholars have posited the theory that liability for losses occasioned by tortious conduct should be levied in a manner consistent with the promotion of the optimum allocation of resources.[290] The Ninth Circuit Court of Appeals in *Union Oil v. Oppen*,[291] was faced with a claim of lost profits by fishermen who, because of an oil spill caused by the defendants, were unable to take their usual fish harvest from the sea.[292] In determining who should bear the cost of the accident, the court placed liability upon the party best able to avoid the costs with the least expense.[293] Several factors were evaluated, including administrative and consumer costs.[294] The court, however, based its determination of liability, upon the ability of one party to correct the error through a "buy out" of the plaintiff's interest.[295] These factors all suggest that the geophysical surveyor should be held accountable for the injuries inflicted. The costs involved in obtaining a geophysical permit, or proper authorization prior to conducting a survey, would appear to be minimal in comparison to the multitude of landowner injuries suffered as a result of the wrongful exploration. Moreover, the geophysical and oil industries have the capacity to alleviate the error through a "buy out" of the landowner's interest.[296] The geophysical explorer, and ultimately society as a whole, benefit from the use of extensive geophysical exploration and should be prepared to bear the cost of negligent operations.

Conclusion

Existing law recognizes that a landowner will suffer harsh consequences when a geophysical survey is conducted without authorization.[297] The theory of "geophysical trespass" provides the

289. 24 Cal. 3d at 808, 598 P.2d at 65-66.
290. 501 F.2d at 569.
291. *Id.* at 558.
292. *Id.*
293. *Id.* at 570.
294. *Id.* at 567.
295. *Id.* at 570.
296. *Id.*
297. *See supra* notes 54-92 and accompanying text.

landowner with an effective remedy against the surreptitious surveyor when the survey is conducted upon or within property lines. The theory, however, is predicated upon the existence of a technical trespass in accordance with traditional trespass law. Geophysical exploration, however, does not require a physical entry onto the surveyed land to be accurate, since the survey may be conducted effectively from nearby lands or from the sky above. As a result, the operator who utilizes geophysical devices that do not respect the confines of property lines avoids liability for the consequences of his act, and the landowner is left without legal redress.

Previously, exploration rights amounted to nothing more than a right to ingress and egress. Modernly, however, these rights have assumed great importance and have warranted protection. If the courts are to continue protecting the right to explore, they must recognize that the destruction of that right may result from a geophysical survey when no physical invasion has occurred. Furthermore, a surreptitious survey that results in a destruction of the landowner's speculative value is no less significant because a physical trespass has been avoided through the use of modern technology.

A number of traditional tort theories which have protected the individual against similar deprivations have been explored to draw attention to the nature of the protected interest and the inadequacies of the traditional theories. Intangible interferences with the landowner's use and enjoyment of his property are actionable as a private nuisance. Modernly, the landowner's use and enjoyment of the mineral estate is directly related to his ability to enter into a sale or leasing agreement. Once the value of the exploration right and the ability to lease have been destroyed, the landowner's use and enjoyment of the mineral estate has been harmed. Courts, however, have been unwilling to allow recovery for nuisance in the absence of actual property damage or an interference with the physical occupancy of the property. When damage to the physical condition of the property results from the survey, recovery for economic losses should be available under the theory of a private nuisance. The use of modern geophysical exploration devices, however, does not result in impairment of the physical condition of the land. Therefore, reliance upon the theory of private nuisance fails to provide the landowner with legal redress.

The right to privacy recognizes that infringement caused by the use of electronic devices and the publication of confidential information should be guarded against. The privacy rights, however, are primarily concerned with personal rather than economic or commercial protections. Recovery based upon disruption of the individual's solitude

could not satisfy the economic losses occasioned by a wrongful geophysical survey.

In the commercial setting, the law of trade secrets protects information against appropriation by unethical means. While the deprivations caused by an unauthorized geophysical survey would not be actionable as the misappropriation of a trade secret, this tort theory provides insight into the nature of improper commercial motives. Complete reliance upon a trade secret analogy, however, is not helpful since the law only contemplates intentional conduct.

The tort theories noted above are independently incapable of providing the landowner with needed relief. The inadequacies of those theories therefore suggest the need for an appropriate remedy. An analysis of these torts has demonstrated that the law has traditionally protected against interference with interests similar to a landowner's interest in information concerning the mineral estate. Furthermore, these tort theories provide the attorney with valuable guidance by analogy.

The unauthorized geophysical survey involves an intangible invasion of the landowner's estate. That survey results in a misappropriation of confidential commercial information, and whether conducted from on or off the property, this misappropriation is the kind of unethical commercial activity that should be guarded against. The tort of interference with prospective advantage can provide the needed legal redress. When the misappropriation of information results in lost profits to the landowner, he is deprived of a prospective advantage and should be compensated. Unlike the tort of trespass, interference with prospective advantage will provide a remedy for wrongs that do not respect the confines of property lines. The landowner's injuries can be redressed both under the intentional and negligent theories of the tort, allocating liability to the party most capable of correcting the existing wrong.

Scott S. Slater